



AMD/C

## SEQUENCE LISTING

<110> De Buyl, Eric  
Lahaye, Andree  
Ledoux, Pierre  
Detroz, Rene

#3

<120> Xylanase, Microorganisms Producing it,  
DNA Molecules, Methods for Preparing this Xylanase and Uses  
of the Latter

<130> GC450-D1-US

<140> US 09/909,207

<141> 2001-07-19

<150> US 08/470,953

<151> 1995-06-06

<150> BE 09500448

<151> 1995-05-17

<150> BE 09400706

<151> 1994-07-26

<160> 29

<170> FastSEQ for Windows Version 4.0

<210> 1

<211> 663

<212> DNA

<213> Bacillus sp.

<400> 1

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| caaatcgtea  | ccgacaattc | cattggcaac | cacgatggct | atgattatga | attttgga    | 60  |
| gatagcgggtg | gctctgggac | aatgattctc | aatcatggcg | gtacgttcag | tgcccaatgg  | 120 |
| aacaatgtta  | acaacatatt | attccgtaaa | ggtaaaaaat | tcaatgaaac | acaaacacac  | 180 |
| caacaagttg  | gtaacatgtc | cataaactac | ggagccaact | tccaaccaaa | tggtaatgcg  | 240 |
| tatttatgcg  | tctatggttg | gactgttgac | cctcttgtcg | aatattatat | tgctcgacagt | 300 |
| tggggcaact  | ggcgtccacc | aggagcaacg | cctaagggga | ccatcactgt | tgatggagga  | 360 |
| acatatgata  | tctacgagac | tcttagagtc | aatcaaccct | ccattaaggg | gattgccaca  | 420 |
| tttaaacaaat | attggagtg  | tcgaagatcg | aaacgcacga | gtggcacgat | ttctgtcagc  | 480 |
| aaccacttta  | gagcgtggga | aaacttaggg | atgaatatgg | ggaaaatgta | tgaagtcgcg  | 540 |
| cttactgtag  | aaggctatca | aagtagcgga | agtgctaata | tatatagcaa | tacactaaga  | 600 |
| attaacggta  | accctctctc | aactattagt | aatgacgaga | gcataacttt | ggataaaaac  | 660 |
| aat         |            |            |            |            |             | 663 |

<210> 2

<211> 663

<212> DNA

<213> Bacillus sp.

<220>

<221> CDS

<222> (1)...(663)

<221> mat\_peptide

<222> (1)...(663)

<400> 2

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|---|-----|
| caa atc gtc acc gac aat tcc att ggc aac cac gat ggc tat gat tat | 48  |
| Gln Ile Val Thr Asp Asn Ser Ile Gly Asn His Asp Gly Tyr Asp Tyr |     |
| 1 5 10 15   |     |
| gaa ttt tgg aaa gat agc ggt ggc tct ggg aca atg att ctc aat cat | 96  |
| Glu Phe Trp Lys Asp Ser Gly Gly Ser Gly Thr Met Ile Leu Asn His |     |
| 20 25 30  |     |
| ggc ggt acg ttc agt gcc caa tgg aac aat gtt aac aac ata tta ttc | 144 |
| Gly Gly Thr Phe Ser Ala Gln Trp Asn Asn Val Asn Asn Ile Leu Phe |     |
| 35 40 45  |     |
| cgt aaa ggt aaa aaa ttc aat gaa aca caa aca cac caa caa gtt ggt | 192 |
| Arg Lys Gly Lys Lys Phe Asn Glu Thr Gln Thr His Gln Gln Val Gly |     |
| 50 55 60  |     |
| aac atg tcc ata aac tac gga gcc aac ttc caa cca aat ggt aat gcg | 240 |
| Asn Met Ser Ile Asn Tyr Gly Ala Asn Phe Gln Pro Asn Gly Asn Ala |     |
| 65 70 75 80   |     |
| tat tta tgc gtc tat ggt tgg act gtt gac cct ctt gtc gaa tat tat | 288 |
| Tyr Leu Cys Val Tyr Gly Trp Thr Val Asp Pro Leu Val Glu Tyr Tyr |     |
| 85 90 95  |     |
| att gtc gac agt tgg ggc aac tgg cgt cca cca gga gca acg cct aag | 336 |
| Ile Val Asp Ser Trp Gly Asn Trp Arg Pro Pro Gly Ala Thr Pro Lys |     |
| 100 105 110   |     |
| ggg acc atc act gtt gat gga gga aca tat gat atc tac gag act ctt | 384 |
| Gly Thr Ile Thr Val Asp Gly Gly Thr Tyr Asp Ile Tyr Glu Thr Leu |     |
| 115 120 125   |     |
| aga gtc aat caa ccc tcc att aag ggg att gcc aca ttt aaa caa tat | 432 |
| Arg Val Asn Gln Pro Ser Ile Lys Gly Ile Ala Thr Phe Lys Gln Tyr |     |
| 130 135 140   |     |
| tgg agt gtt cga aga tcg aaa cgc acg agt ggc acg att tct gtc agc | 480 |
| Trp Ser Val Arg Arg Ser Lys Arg Thr Ser Gly Thr Ile Ser Val Ser |     |
| 145 150 155 160   |     |
| aac cac ttt aga gcg tgg gaa aac tta ggg atg aat atg ggg aaa atg | 528 |
| Asn His Phe Arg Ala Trp Glu Asn Leu Gly Met Asn Met Gly Lys Met |     |
| 165 170 175   |     |
| tat gaa gtc gcg ctt act gta gaa ggc tat caa agt agc gga agt gct | 576 |
| Tyr Glu Val Ala Leu Thr Val Glu Gly Tyr Gln Ser Ser Gly Ser Ala |     |
| 180 185 190   |     |
| aat gta tat agc aat aca cta aga att aac ggt aac cct ctc tca act | 624 |
| Asn Val Tyr Ser Asn Thr Leu Arg Ile Asn Gly Asn Pro Leu Ser Thr |     |
| 195 200 205   |     |
| att agt aat gac gag agc ata act ttg gat aaa aac aat             | 663 |
| Ile Ser Asn Asp Glu Ser Ile Thr Leu Asp Lys Asn Asn             |     |
| 210 215 220   |     |

<210> 3

<211> 221  
 <212> PRT  
 <213> Bacillus sp.

<400> 3

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Gln | Ile | Val | Thr | Asp | Asn | Ser | Ile | Gly | Asn | His | Asp | Gly | Tyr | Asp | Tyr |
| 1   |     |     |     | 5   |     |     |     |     | 10  |     |     |     |     | 15  |     |
| Glu | Phe | Trp | Lys | Asp | Ser | Gly | Gly | Ser | Gly | Thr | Met | Ile | Leu | Asn | His |
|     |     |     | 20  |     |     |     |     | 25  |     |     |     |     | 30  |     |     |
| Gly | Gly | Thr | Phe | Ser | Ala | Gln | Trp | Asn | Asn | Val | Asn | Asn | Ile | Leu | Phe |
|     |     | 35  |     |     |     | 40  |     |     |     |     | 45  |     |     |     |     |
| Arg | Lys | Gly | Lys | Lys | Phe | Asn | Glu | Thr | Gln | Thr | His | Gln | Gln | Val | Gly |
|     | 50  |     |     |     |     | 55  |     |     |     |     | 60  |     |     |     |     |
| Asn | Met | Ser | Ile | Asn | Tyr | Gly | Ala | Asn | Phe | Gln | Pro | Asn | Gly | Asn | Ala |
| 65  |     |     |     |     | 70  |     |     |     | 75  |     |     |     |     |     | 80  |
| Tyr | Leu | Cys | Val | Tyr | Gly | Trp | Thr | Val | Asp | Pro | Leu | Val | Glu | Tyr | Tyr |
|     |     |     | 85  |     |     |     |     | 90  |     |     |     |     | 95  |     |     |
| Ile | Val | Asp | Ser | Trp | Gly | Asn | Trp | Arg | Pro | Pro | Gly | Ala | Thr | Pro | Lys |
|     |     |     | 100 |     |     |     |     | 105 |     |     |     |     | 110 |     |     |
| Gly | Thr | Ile | Thr | Val | Asp | Gly | Gly | Thr | Tyr | Asp | Ile | Tyr | Glu | Thr | Leu |
|     |     | 115 |     |     |     | 120 |     |     |     |     |     | 125 |     |     |     |
| Arg | Val | Asn | Gln | Pro | Ser | Ile | Lys | Gly | Ile | Ala | Thr | Phe | Lys | Gln | Tyr |
|     | 130 |     |     |     |     | 135 |     |     |     |     | 140 |     |     |     |     |
| Trp | Ser | Val | Arg | Arg | Ser | Lys | Arg | Thr | Ser | Gly | Thr | Ile | Ser | Val | Ser |
| 145 |     |     |     |     | 150 |     |     |     |     | 155 |     |     |     |     | 160 |
| Asn | His | Phe | Arg | Ala | Trp | Glu | Asn | Leu | Gly | Met | Asn | Met | Gly | Lys | Met |
|     |     |     | 165 |     |     |     |     | 170 |     |     |     |     |     | 175 |     |
| Tyr | Glu | Val | Ala | Leu | Thr | Val | Glu | Gly | Tyr | Gln | Ser | Ser | Gly | Ser | Ala |
|     |     |     | 180 |     |     |     |     | 185 |     |     |     |     | 190 |     |     |
| Asn | Val | Tyr | Ser | Asn | Thr | Leu | Arg | Ile | Asn | Gly | Asn | Pro | Leu | Ser | Thr |
|     |     | 195 |     |     |     | 200 |     |     |     |     |     | 205 |     |     |     |
| Ile | Ser | Asn | Asp | Glu | Ser | Ile | Thr | Leu | Asp | Lys | Asn | Asn |     |     |     |
|     | 210 |     |     |     |     | 215 |     |     |     |     |     | 220 |     |     |     |

<210> 4  
 <211> 744  
 <212> DNA  
 <213> Bacillus sp.

<400> 4

|            |             |             |             |            |             |     |
|------------|-------------|-------------|-------------|------------|-------------|-----|
| atgagacaaa | agaaattgac  | gttgatttta  | gccttttttag | tttgttttgc | actaacctta  | 60  |
| cctgcagaaa | taatttcaggc | acaaatcgtc  | accgacaatt  | ccattggcaa | ccacgatggc  | 120 |
| tatgattatg | aatttttgaa  | agatagcggg  | ggctctggga  | caatgattct | caatcatggc  | 180 |
| ggtacgttca | gtgcccaatg  | gaacaatgtt  | aacaacatat  | tattccgtaa | aggtaaaaaa  | 240 |
| ttcaatgaaa | cacaaacaca  | ccaacaagtt  | ggtaacatgt  | ccataaacta | cggagccaac  | 300 |
| ttccaaccaa | atggtaatgc  | gtattttatgc | gtctatgggt  | ggactgttga | ccctcttgtc  | 360 |
| gaatattata | ttgtcgacag  | ttggggcaac  | tggcgccac   | caggagcaac | gcctaagggg  | 420 |
| accatcactg | ttgatggagg  | aacatatgat  | atctacgaga  | ctcttagagt | caatcaaccc  | 480 |
| tccattaagg | ggattgccac  | atttaaacaa  | tattggagtg  | ttcgaagatc | gaaacgcacg  | 540 |
| agtggcacga | tttctgtcag  | caaccacttt  | agagcgtggg  | aaaacttagg | gatgaatatg  | 600 |
| gggaaaatgt | atgaagtcgc  | gcttactgta  | gaaggctatc  | aaagtagcgg | aagtgctaata | 660 |
| gtatatagca | atacactaag  | aattaacggt  | aaccctctct  | caactattag | taatgacgag  | 720 |
| agcataactt | tgataaaaa   | caat        |             |            |             | 744 |

<210> 5  
 <211> 744  
 <212> DNA  
 <213> Bacillus sp.

<220>

<221> CDS  
 <222> (1)...(744)

<221> mat\_peptide  
 <222> (1)...(744)

<221> sig\_peptide  
 <222> (82)...(744)

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 atg aga caa aag aaa ttg acg ttg att tta gcc ttt tta gtt tgt ttt 48  
 Met Arg Gln Lys Lys Leu Thr Leu Ile Leu Ala Phe Leu Val Cys Phe  
 1 5 10 15  
 gca cta acc tta cct gca gaa ata att cag gca caa atc gtc acc gac 96  
 Ala Leu Thr Leu Pro Ala Glu Ile Ile Gln Ala Gln Ile Val Thr Asp  
 20 25 30  
 aat tcc att ggc aac cac gat ggc tat gat tat gaa ttt tgg aaa gat 144  
 Asn Ser Ile Gly Asn His Asp Gly Tyr Asp Tyr Glu Phe Trp Lys Asp  
 35 40 45  
 agc ggt ggc tct ggg aca atg att ctc aat cat ggc ggt acg ttc agt 192  
 Ser Gly Gly Ser Gly Thr Met Ile Leu Asn His Gly Gly Thr Phe Ser  
 50 55 60  
 gcc caa tgg aac aat gtt aac aac ata tta ttc cgt aaa ggt aaa aaa 240  
 Ala Gln Trp Asn Asn Val Asn Asn Ile Leu Phe Arg Lys Gly Lys Lys  
 65 70 75 80  
 ttc aat gaa aca caa aca cac caa caa gtt ggt aac atg tcc ata aac 288  
 Phe Asn Glu Thr Gln Thr His Gln Gln Val Gly Asn Met Ser Ile Asn  
 85 90 95  
 tac gga gcc aac ttc caa cca aat ggt aat gcg tat tta tgc gtc tat 336  
 Tyr Gly Ala Asn Phe Gln Pro Asn Gly Asn Ala Tyr Leu Cys Val Tyr  
 100 105 110  
 ggt tgg act gtt gac cct ctt gtc gaa tat tat att gtc gac agt tgg 384  
 Gly Trp Thr Val Asp Pro Leu Val Glu Tyr Tyr Ile Val Asp Ser Trp  
 115 120 125  
 ggc aac tgg cgt cca cca gga gca acg cct aag ggg acc atc act gtt 432  
 Gly Asn Trp Arg Pro Pro Gly Ala Thr Pro Lys Gly Thr Ile Thr Val  
 130 135 140  
 gat gga gga aca tat gat atc tac gag act ctt aga gtc aat caa ccc 480  
 Asp Gly Gly Thr Tyr Asp Ile Tyr Glu Thr Leu Arg Val Asn Gln Pro  
 145 150 155 160  
 tcc att aag ggg att gcc aca ttt aaa caa tat tgg agt gtt cga aga 528  
 Ser Ile Lys Gly Ile Ala Thr Phe Lys Gln Tyr Trp Ser Val Arg Arg  
 165 170 175  
 tcg aaa cgc acg agt ggc acg att tct gtc agc aac cac ttt aga gcg 576  
 Ser Lys Arg Thr Ser Gly Thr Ile Ser Val Ser Asn His Phe Arg Ala  
 180 185 190  
 tgg gaa aac tta ggg atg aat atg ggg aaa atg tat gaa gtc gcg ctt 624  
 Trp Glu Asn Leu Gly Met Asn Met Gly Lys Met Tyr Glu Val Ala Leu

| 195   | 200 | 205 |     |
|---|-----|-----|-----|
| act gta gaa ggc tat caa agt agc gga agt gct aat gta tat agc aat |     |     | 672 |
| Thr Val Glu Gly Tyr Gln Ser Ser Gly Ser Ala Asn Val Tyr Ser Asn |     |     |     |
| 210   | 215 | 220 |     |
| aca cta aga att aac ggt aac cct ctc tca act att agt aat gac gag |     |     | 720 |
| Thr Leu Arg Ile Asn Gly Asn Pro Leu Ser Thr Ile Ser Asn Asp Glu |     |     |     |
| 225   | 230 | 235 | 240 |
| agc ata act ttg gat aaa aac aat                                 |     |     | 744 |
| Ser Ile Thr Leu Asp Lys Asn Asn                                 |     |     |     |
| 245   |     |     |     |

<210> 6  
 <211> 248  
 <212> PRT  
 <213> Bacillus sp.

<400> 6

|   |  |  |  |
|---|--|--|--|
| Met Arg Gln Lys Lys Leu Thr Leu Ile Leu Ala Phe Leu Val Cys Phe |  |  |  |
| 1 5 10 15   |  |  |  |
| Ala Leu Thr Leu Pro Ala Glu Ile Ile Gln Ala Gln Ile Val Thr Asp |  |  |  |
| 20 25 30  |  |  |  |
| Asn Ser Ile Gly Asn His Asp Gly Tyr Asp Tyr Glu Phe Trp Lys Asp |  |  |  |
| 35 40 45  |  |  |  |
| Ser Gly Gly Ser Gly Thr Met Ile Leu Asn His Gly Gly Thr Phe Ser |  |  |  |
| 50 55 60  |  |  |  |
| Ala Gln Trp Asn Asn Val Asn Asn Ile Leu Phe Arg Lys Gly Lys Lys |  |  |  |
| 65 70 75 80   |  |  |  |
| Phe Asn Glu Thr Gln Thr His Gln Gln Val Gly Asn Met Ser Ile Asn |  |  |  |
| 85 90 95  |  |  |  |
| Tyr Gly Ala Asn Phe Gln Pro Asn Gly Asn Ala Tyr Leu Cys Val Tyr |  |  |  |
| 100 105 110   |  |  |  |
| Gly Trp Thr Val Asp Pro Leu Val Glu Tyr Tyr Ile Val Asp Ser Trp |  |  |  |
| 115 120 125   |  |  |  |
| Gly Asn Trp Arg Pro Pro Gly Ala Thr Pro Lys Gly Thr Ile Thr Val |  |  |  |
| 130 135 140   |  |  |  |
| Asp Gly Gly Thr Tyr Asp Ile Tyr Glu Thr Leu Arg Val Asn Gln Pro |  |  |  |
| 145 150 155 160   |  |  |  |
| Ser Ile Lys Gly Ile Ala Thr Phe Lys Gln Tyr Trp Ser Val Arg Arg |  |  |  |
| 165 170 175   |  |  |  |
| Ser Lys Arg Thr Ser Gly Thr Ile Ser Val Ser Asn His Phe Arg Ala |  |  |  |
| 180 185 190   |  |  |  |
| Trp Glu Asn Leu Gly Met Asn Met Gly Lys Met Tyr Glu Val Ala Leu |  |  |  |
| 195 200 205   |  |  |  |
| Thr Val Glu Gly Tyr Gln Ser Ser Gly Ser Ala Asn Val Tyr Ser Asn |  |  |  |
| 210 215 220   |  |  |  |
| Thr Leu Arg Ile Asn Gly Asn Pro Leu Ser Thr Ile Ser Asn Asp Glu |  |  |  |
| 225 230 235 240   |  |  |  |
| Ser Ile Thr Leu Asp Lys Asn Asn                                 |  |  |  |
| 245   |  |  |  |

<210> 7  
 <211> 81  
 <212> DNA  
 <213> Bacillus sp.

<400> 7

atgagacaaa agaaattgac gttgatttta gccttttttag tttgttttgc actaacctta 60  
cctgcagaaa taattcaggc a 81

<210> 8  
<211> 81  
<212> DNA  
<213> Bacillus sp.

<220>  
<221> CDS  
<222> (1)...(81)

<221> sig\_peptide  
<222> (1)...(81)

<400> 8  
atg aga caa aag aaa ttg acg ttg att tta gcc ttt tta gtt tgt ttt 48  
Met Arg Gln Lys Lys Leu Thr Leu Ile Leu Ala Phe Leu Val Cys Phe  
1 5 10 15

gca cta acc tta cct gca gaa ata att cag gca 81  
Ala Leu Thr Leu Pro Ala Glu Ile Ile Gln Ala  
20 25

<210> 9  
<211> 27  
<212> PRT  
<213> Bacillus sp.

<400> 9  
Met Arg Gln Lys Lys Leu Thr Leu Ile Leu Ala Phe Leu Val Cys Phe  
1 5 10 15  
Ala Leu Thr Leu Pro Ala Glu Ile Ile Gln Ala  
20 25

<210> 10  
<211> 1513  
<212> DNA  
<213> Bacillus sp.

<400> 10  
aaattgaatt gtgtatatct aatgataacg acaaatcgtc actgttttta aactaatctc 60  
aaaccaatac ttcttttattt aacgctaacc acttgcaatc ttatcacaag aacattcttt 120  
ataggaactt tcccatttgc aagacgataa aaaatctttt tcccctattt tatcttatcg 180  
ccttgatcgg tttaatttgt aaactttatt ttagtttacg tgatgttccc tcattcatac 240  
cattaatcac agttaacgct agagtcactt tttttcgggt ctcaaaaata cctgaagaac 300  
atztatgtca tattttctca cgccgctcca taatggaata tatatactct tttatacata 360  
ttaagtaaata tagtatatac ttgcgttatc aaaatgtgag ataatactaat tgatcaaaca 420  
agcagctatc caaaaaacac tgatgttgac ctcttaaaga agtgtcacta tctatgaaaa 480  
gataattatc cagtttcaaa atttgaaata gtgtgtatgg aatagtttga atgtcaactg 540  
ctgtgaaagg agggtaggta gtaccgtaga cttcattacc aaaaatttagt tgtaaaaaaa 600  
ttaaaggag gaatgcctaa tgagacaaaa gaaattgacg ttgatttttag ccttttttagt 660  
ttgttttgca ctaaccttac ctgcagaaat aattcaggca caaatcgta cgcacaattc 720  
cattggcaac cacgatggct atgattatga attttgaaaa gatagcgggtg gctctgggac 780  
aatgattctc aatcatggcg gtacgttcag tgcccaatgg aacaatgta acaacatatt 840  
attccgtaaa ggtaaaaaat tcaatgaaac acaaacacac caacaagttg gtaacatgtc 900  
cataaactac ggagccaact tccaaccaa tggtaatgcg tatttatgcg tctatggttg 960  
gactgttgac cctcttgtcg aatattatat tgtcgacagt tggggcaact ggcgtccacc 1020  
aggagcaacg cctaagggga ccatcactgt tgatggagga acatatgata tctacgagac 1080

|            |             |            |            |            |            |      |
|------------|-------------|------------|------------|------------|------------|------|
| tcttagagtc | aatcaaccct  | ccattaaggg | gattgccaca | tttaaacaat | attggagtgt | 1140 |
| tcgaagatcg | aaacgcacga  | gtggcacgat | ttctgtcagc | aaccacttta | gagcgtggga | 1200 |
| aaacttaggg | atgaatatgg  | ggaaaatgta | tgaagtcgcg | cttactgtag | aaggctatca | 1260 |
| aagtagcggg | agtgctaattg | tatatagcaa | tacactaaga | attaacggta | accctctctc | 1320 |
| aactattagt | aatgacgaga  | gcataacttt | ggataaaaac | aattaaaaat | ccttatctct | 1380 |
| ttcggttcag | ttctcattat  | tttcaaataa | cctcccggtt | ggatcttttc | caacgggagg | 1440 |
| ttttattgga | aaggttaagt  | atagtatact | ccgattccat | ccagaggaat | gcttgaaaca | 1500 |
| cctccgtcac | tag         |            |            |            |            | 1513 |

<210> 11

<211> 1513

<212> DNA

<213> Bacillus sp.

<220>

<221> CDS

<222> (620)...(1363)

<221> mat\_peptide

<222> (701)...(1363)

<221> sig\_peptide

<222> (620)...(700)

<400> 11

|             |             |             |             |             |            |     |
|-------------|-------------|-------------|-------------|-------------|------------|-----|
| aaattgaatt  | gtgtatatct  | aatgataacg  | acaaatcgtc  | actgttttta  | aactaatctc | 60  |
| aaaccaatac  | ttctttatatt | aacgctaacc  | acttgcaatc  | ttatcacaag  | aacattcttt | 120 |
| ataggaactt  | tcccatttgc  | aagacgataa  | aaaatctttt  | tcccctattt  | tatcttatcg | 180 |
| ccttgatcgg  | tttaatttgt  | aaactttatt  | ttagtttacg  | tgatgttccc  | tcattcatac | 240 |
| cattaatcac  | agttaacgct  | agagtcacat  | tttttcggtt  | ctcaaaaata  | cctgaagaac | 300 |
| atztatgtca  | tattttctca  | cgccgctcca  | taatggaata  | tatatactct  | tttatacata | 360 |
| ttaagtaaatt | tagtatatac  | ttgcgttatc  | aaaatgtgag  | ataatctaatt | tgatcaaaca | 420 |
| agcagctatc  | caaaaaaacac | tgatgttgac  | ctcttaaaga  | agtgtcacta  | tctatgaaaa | 480 |
| gataattatc  | cagtttcaaa  | atttgaaata  | gtgtgtatgg  | aatagtttga  | atgtcaactg | 540 |
| ctgtgaaagg  | agggtaggta  | gtaccgtaga  | cttcattacc  | aaaaattagt  | tgtaaaaaaa | 600 |
| ttaaaaggag  | gaatgccta   | atg aga caa | aag aaa ttg | acg ttg att | tta gcc    | 652 |
|             | Met Arg Gln | Lys Lys Leu | Thr Leu Ile | Leu Ala     |            |     |
|             | 1           | 5           | 10          |             |            |     |

|                 |                 |                 |                 |     |
|-----------------|-----------------|-----------------|-----------------|-----|
| ttt tta gtt tgt | ttt gca cta acc | tta cct gca gaa | ata att cag gca | 700 |
| Phe Leu Val Cys | Phe Ala Leu Thr | Leu Pro Ala Glu | Ile Ile Gln Ala |     |
| 15              | 20              | 25              |                 |     |

|                 |                 |                 |                 |     |
|-----------------|-----------------|-----------------|-----------------|-----|
| caa atc gtc acc | gac aat tcc att | ggc aac cac gat | ggc tat gat tat | 748 |
| Gln Ile Val Thr | Asp Asn Ser Ile | Gly Asn His Asp | Gly Tyr Asp Tyr |     |
| 30              | 35              | 40              |                 |     |

|                 |                 |                 |                 |     |
|-----------------|-----------------|-----------------|-----------------|-----|
| gaa ttt tgg aaa | gat agc ggt ggc | tct ggg aca atg | att ctc aat cat | 796 |
| Glu Phe Trp Lys | Asp Ser Gly Gly | Ser Gly Thr Met | Ile Leu Asn His |     |
| 45              | 50              | 55              |                 |     |

|                 |                 |                 |                 |     |
|-----------------|-----------------|-----------------|-----------------|-----|
| ggc ggt acg ttc | agt gcc caa tgg | aac aat gtt aac | aac ata tta ttc | 844 |
| Gly Gly Thr Phe | Ser Ala Gln Trp | Asn Asn Val Asn | Asn Ile Leu Phe |     |
| 60              | 65              | 70              | 75              |     |

|                 |                 |                 |                 |     |
|-----------------|-----------------|-----------------|-----------------|-----|
| cgt aaa ggt aaa | aaa ttc aat gaa | aca caa aca cac | caa caa gtt ggt | 892 |
| Arg Lys Gly Lys | Lys Phe Asn Glu | Thr Gln Thr His | Gln Gln Val Gly |     |
| 80              | 85              | 90              |                 |     |

|                 |                 |                 |                 |     |
|-----------------|-----------------|-----------------|-----------------|-----|
| aac atg tcc ata | aac tac gga gcc | aac ttc caa cca | aat ggt aat gcg | 940 |
|-----------------|-----------------|-----------------|-----------------|-----|

|  |      |
|--|------|
| Asn Met Ser Ile Asn Tyr Gly Ala Asn Phe Gln Pro Asn Gly Asn Ala    |      |
| 95 100 105   |      |
| tat tta tgc gtc tat ggt tgg act gtt gac cct ctt gtc gaa tat tat    | 988  |
| Tyr Leu Cys Val Tyr Gly Trp Thr Val Asp Pro Leu Val Glu Tyr Tyr    |      |
| 110 115 120  |      |
| att gtc gac agt tgg ggc aac tgg cgt cca cca gga gca acg cct aag    | 1036 |
| Ile Val Asp Ser Trp Gly Asn Trp Arg Pro Pro Gly Ala Thr Pro Lys    |      |
| 125 130 135  |      |
| ggg acc atc act gtt gat gga gga aca tat gat atc tac gag act ctt    | 1084 |
| Gly Thr Ile Thr Val Asp Gly Gly Thr Tyr Asp Ile Tyr Glu Thr Leu    |      |
| 140 145 150 155  |      |
| aga gtc aat caa ccc tcc att aag ggg att gcc aca ttt aaa caa tat    | 1132 |
| Arg Val Asn Gln Pro Ser Ile Lys Gly Ile Ala Thr Phe Lys Gln Tyr    |      |
| 160 165 170  |      |
| tgg agt gtt cga aga tcg aaa cgc acg agt ggc acg att tct gtc agc    | 1180 |
| Trp Ser Val Arg Arg Ser Lys Arg Thr Ser Gly Thr Ile Ser Val Ser    |      |
| 175 180 185  |      |
| aac cac ttt aga gcg tgg gaa aac tta ggg atg aat atg ggg aaa atg    | 1228 |
| Asn His Phe Arg Ala Trp Glu Asn Leu Gly Met Asn Met Gly Lys Met    |      |
| 190 195 200  |      |
| tat gaa gtc gcg ctt act gta gaa ggc tat caa agt agc gga agt gct    | 1276 |
| Tyr Glu Val Ala Leu Thr Val Glu Gly Tyr Gln Ser Ser Gly Ser Ala    |      |
| 205 210 215  |      |
| aat gta tat agc aat aca cta aga att aac ggt aac cct ctc tca act    | 1324 |
| Asn Val Tyr Ser Asn Thr Leu Arg Ile Asn Gly Asn Pro Leu Ser Thr    |      |
| 220 225 230 235  |      |
| att agt aat gac gag agc ata act ttg gat aaa aac aat taaaaatcct     | 1373 |
| Ile Ser Asn Asp Glu Ser Ile Thr Leu Asp Lys Asn Asn                |      |
| 240 245  |      |
| tatctcttttc ggttcagttc tcattatttt caaataacct cccggttgga tcttttccaa | 1433 |
| cgaggaggttt tattggaaag gttaagtata gtatactccg attccatcca gaggaatgct | 1493 |
| tgaacacact ccgtcactag  | 1513 |
| <210> 12   |      |
| <211> 619  |      |
| <212> DNA  |      |
| <213> Bacillus sp.   |      |
| <400> 12   |      |
| aaattgaatt gtgtatatct aatgataacg acaaatcgtc actgttttta aactaatctc  | 60   |
| aaaccaatac ttcttttattt aacgctaacc acttgcaatc ttatcacaag aacattcttt | 120  |
| ataggaactt tcccatttgc aagacgataa aaaatctttt tcccctattt tatcttatcg  | 180  |
| ccttgatcgg tttaatttgt aaactttatt ttagtttacg tgatgttccc tcattcatac  | 240  |
| cattaatcac agttaacgct agagtcactt tttttcgggt ctcaaaaata cctgaagaac  | 300  |
| atttatgtca ttttttctca cgccgctcca taatggaata tatatactct tttatacata  | 360  |
| ttaagtaaat tagtatatac ttgcggtatc aaaatgtgag ataatactaat tgatcaaaca | 420  |
| agcagctatc caaaaaaacac tgatgttgac ctcttaaaga agtgtcacta tctatgaaaa | 480  |
| gataattatc cagttttcaaa atttgaaata gtgtgtatgg aatagtttga atgtcaactg | 540  |
| ctgtgaaagg agggtaggta gtaccgtaga cttcattacc aaaaattagt tgtaaaaaaa  | 600  |
| ttaaaaggag gaatgccta   | 619  |



<210> 13  
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 <213> Bacillus sp.

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 ggaaa 185  
  
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|     |     |     |     |     |     |     |     |     |     |     |    |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|----|
| 1   | 5   | 10  | 15  |     |     |     |     |     |     |     |    |
| gtg | ctg | aca | ctg | acg | gct | gtg | ccg | gct | cat | gcg | 81 |
| Val | Leu | Thr | Leu | Thr | Ala | Val | Pro | Ala | His | Ala |    |
|     |     |     | 20  |     |     |     |     | 25  |     |     |    |

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 <213> Bacillus pumilus

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|----------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| <400> 29 |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| Met      | Asn | Leu | Lys | Arg | Leu | Arg | Leu | Leu | Phe | Val | Met | Cys | Ile | Gly | Phe |
| 1        |     |     |     | 5   |     |     |     |     | 10  |     |     |     |     | 15  |     |
| Val      | Leu | Thr | Leu | Thr | Ala | Val | Pro | Ala | His | Ala |     |     |     |     |     |
|          |     |     | 20  |     |     |     |     | 25  |     |     |     |     |     |     |     |